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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/816,236	03/31/2004	Conrad Q. Grenfell	GREN-001	9163
28661	7590	04/22/2005	EXAMINER	
SIERRA PATENT GROUP, LTD.			LEUNG, RICHARD L	
P O BOX 6149			ART UNIT	
STATELINE, NV 89449			PAPER NUMBER	
			3744	

DATE MAILED: 04/22/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/816,236	GRENFELL, CONRAD Q.	
	<b>Examiner</b>	<b>Art Unit</b>	
	Richard L. Leung	3744	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 31 March 2004.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☒ Claim(s) 7 and 17 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 31 March 2004 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date <u>8/9/04</u> . | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Priority***

1. Applicant's claim for domestic priority under 35 U.S.C. 119(e) is acknowledged. However, the provisional application (60/459893) upon which priority is claimed fails to provide adequate support under 35 U.S.C. 112 for claims 1-20 of this application. While the provisional application discloses the general concepts related to the present application, there is insufficient disclosure of the structural features necessitated by the claims. For instance, there is no mention of an inlet valve for receiving an inlet gas stream as required by independent claims 1, 11, and 17, and there is no mention of a fluid conduit comprising low heat gain insulation as required by claims 2 and 3. Since the various structural features of the claimed invention are not sufficiently supported by the provisional application, domestic priority will not be granted. However, priority will be reconsidered if Applicant can demonstrate where the features of claims 1-20 are properly supported by the provisional application.

### ***Drawings***

2. New corrected drawings in compliance with 37 CFR 1.121(d) are required in this application because the figures appear informal. It should be particularly noted that the header of sheet 6 of the drawings partially overlaps Fig. 6 and is therefore unacceptable. Refer to 37 CFR 1.84 for the standards of the drawings. Applicant is advised to employ the services of a competent patent draftsman outside the Office, as the U.S. Patent and Trademark Office no longer prepares new drawings. The

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corrected drawings are required in reply to the Office action to avoid abandonment of the application. The requirement for corrected drawings will not be held in abeyance.

***Claim Objections***

3. Claim 7 is objected to because of the following informalities: the recitation of, "to control said liquid discharge flow," is unclear. As understood, the discharge control valve would control the gas stream exiting the recovery heat exchanger. Accordingly, it is suggested that "liquid discharge flow" be changed to -- gas flow --. Appropriate correction is required.

4. Claim 17 is objected to because of the following informalities: it is unclear what is meant by the limitation, "storing an ambient liquid in a high pressure storage unit," as it relates to the present invention. From the written description (page 18, paragraph [0039]), it is understood that a gas stream exiting the recovery heat exchanger is stored in a high-pressure storage unit, and not "an ambient liquid." Accordingly, for the purpose of examination, this limitation will be treated as referring to said gas stream rather than said ambient liquid. However, appropriate correction is required.

***Claim Rejections - 35 USC § 112***

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5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. Claim 3 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is unclear what the recited "inner pressure carrier pipe" is, rendering the claim indefinite. Furthermore, it is unclear what is meant by the term

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"super-insulation," which does not seem to be a term commonly used in the art and no explicit definition is apparent in Applicant's disclosure. Appropriate clarification is required to overcome this rejection. Since the claim is too ambiguous in scope, no prior art could reasonably be applied to the claim. However, this is not to be a presumed indication of allowable subject matter.

***Claim Rejections - 35 USC § 103***

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1, 2, 5-8, and 10-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5505232 (Barclay) in view of US 3735600 (Dowdell et al.).

Regarding claims 1, 2, 7, 8, 10-13, 16-18 and 20, Barclay discloses a natural gas pressurization system and method comprising a natural gas stream inlet 12, a clean-up system 16 coupled to said gas inlet 12, said clean-up system 16 configured to remove impurities from said inlet gas stream selected from the group consisting of water, carbon dioxide, C6+, heavy hydrocarbons, and sulfur compounds (column 5, lines 32-40), a recovery heat exchanger 26 coupled to said clean-up system 16, said recovery heat exchanger 26 configured to remove thermal energy from said inlet natural gas stream and cool said inlet natural gas steam into one of a pre-cooled gas stream and a pre-cooled liquid stream (column 2, lines 49-53), a turbo-expander 28 (Fig. 1) coupled to said recovery heat exchanger 26, said expander 28 configured to expand said pre-

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cooled natural gas stream into a two-phase fluid (column 2, lines 56-60), a refrigeration unit 50 coupled to said expander 28, said refrigeration unit 50 configured to cool said two-phase fluid into a liquid phase fluid and liquefy said vapor to one of a saturated and sub-cooled thermodynamic condition (column 3, lines 41-45), said refrigeration unit 50 being at least one of a cascade refrigeration unit, a closed loop refrigeration unit and a plurality of refrigeration units (column 3, lines 23-45), a buffer storage unit 62 coupled to said refrigeration unit 50 (column 3, lines 52-53), said buffer storage unit 62 inherently configured to provide a net positive suction head since the fluid stream must flow towards it, a pump 70 coupled to said buffer storage unit 62 at a pump suction, said pump 70 having a pump discharge coupled to said recovery heat exchanger 26 to pump the liquid from buffer storage unit 62 through said recovery heat exchanger 26, wherein said recovery heat exchanger 26 is configured to transfer thermal energy from said inlet natural gas stream to a liquid discharge from said pump discharge (column 3, line 64 - column 4, line 13), and a high pressure storage unit 81 coupled to said pump discharge downstream of said recovery heat exchanger 26 (column 4, lines 7-22). Since the entire system may be housed underground (column 5, lines 28-30), storage unit 81 can be considered an underground storage reservoir. Barclay further discloses that the fluid conduits coupling the various components of the system are insulated (column 2, lines 44-47), which is understood to mean very low heat gain insulation since the purpose is to prevent heat leak into the system. Barclay, however, fails to disclose a gas inlet valve configured to receive the inlet natural gas stream 12. Dowdell et al. teach a related system for handling natural gas comprising a clean-up system 14 for removing

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impurities, a heat recovery heat exchanger 22, and an expansion device 26. Dowdell et al. further teach the use of a gas inlet valve 12 coupled to said clean-up system 14 configured to receive an inlet natural gas stream which is used to control the inlet gas pressure (column 11, lines 54-60). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included a gas inlet valve as taught by Dowdell et al. in the system disclosed by Barclay as a means for regulating the inlet stream of natural gas, particularly the pressure of said inlet stream. It would also have been apparent to one of ordinary skill in the art that a valve on the inlet conduit would allow the gas flow to the system to be shutoff, which would be necessary at times of repair or emergency situations, etc.

Regarding claims 5, 6, 14, and 19, while Barclay discloses that work is outputted from said expander 28 (Fig. 1), Barclay fails to expressly disclose an energy absorbing device coupled to said expander 28, wherein said energy absorbing device converts mechanical energy from said expander 28 for use by said refrigeration unit 50, or wherein said energy absorbing device comprises at least one of an electrical generator, a gas compressor and a hydraulic pump. Dowdell et al. teach that it is already known in the art to use the power obtained from an expander for the compression power of a refrigeration cycle (column 2, lines 62-65). Specifically, Dowdell et al. demonstrate a system and method wherein gas is expanded through a turboexpander 56 producing work used to power a gas compressor system 50 (column 14, lines 24-29), which is used in a refrigeration cycle to produce cold gas for heat exchange. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was

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made to have included in the system disclosed by Barclay, an energy absorbing device, particularly a gas compressor, to utilize the work produced by the expander 28 in the refrigeration unit 50 because doing so would increase the efficiency of the system since less additional power would be needed to operate the refrigeration unit 50.

Regarding claim 15, Barclay fails to expressly disclose a gaseous natural gas stream coupled to said buffer storage unit 62 that is configured to provide at least one of a fuel for said refrigeration and an additional cooling fluid in said recovery heat exchanger 26. In their related system, Dowdell et al. teach that a gaseous natural gas stream in line 34 coupled to a buffer storage unit 30 can be used to provide a cooling fluid in a recovery heat exchanger 22 to cool an incoming gas stream (column 13, lines 7-33). Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to have included an additional natural gas stream, in the system disclosed by Barclay, from storage unit 62 to the recovery heat exchanger 26 to provide an additional cooling fluid in said recovery heat exchanger 26 because doing so would increase the efficiency of the system by harnessing the cooling power of the vapor in said storage unit 62 which may otherwise be wasted.

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9. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5505232 (Barclay) in view of US 3735600 (Dowdell et al.) as applied to claim 1 above, and further in view of US 6374844 B1 (Hall). The combination of Barclay and Dowdell et al., as already discussed above, demonstrates all the limitations of the claim except for expressly disclosing a discharge control valve between said recovery heat exchanger and said high pressure storage unit, said discharge control valve configured



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to control said discharge flow to said high pressure storage unit. The use of control valves is already conventional in the art, and is considered to be well within the knowledge of one of ordinary skill. Hall demonstrates an example. Hall teaches a system for storing gas, particularly natural gas, in an underground storage unit 2, wherein the inlet conduit 7 for transferring gas to said storage unit 2 comprises a discharge control valve 8 for controlling the inlet stream discharged from compressors 4 and 5. It would have been obvious to one of ordinary skill in the art at the time the invention was made, given the teaching of Hall, to have included a discharge control valve between the recovery heat exchanger and the high pressure storage unit in the combination of Barclay and Dowdell et al. because doing so would allow one to control the amount of gas being supplied to said storage and allow the gas flow to the unit to be shutoff at times of repair, over-pressurizing, emergency situations, etc.

10. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 5505232 (Barclay) in view of US 3735600 (Dowdell et al.) as applied to claim 1 above, and further in view of US 6354088 B1 (Emmer et al.). The combination of Barclay and Dowdell et al., as already discussed above, demonstrates all the limitations of the claim except for expressly disclosing that said pump comprises at least one of a submerged multistage centrifugal pump and a positive displace pump and a plurality of incompressible fluid pumps. Emmer et al. teach a system for dispensing cryogenic liquids from a tank 10, in particular liquefied natural gas (column 3, lines 58-62), to which is connected a pump 30 that preferably comprises a submerged positive displacement pump (column 3, lines 29-30 and column 6, lines 32-34). Said pump 30 is

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used to dispense liquefied natural gas from said tank 10, some of which travels to a heat exchanger 52 where said liquefied natural gas is warmed (column 4, lines 22-23). This arrangement is analogous to the system disclosed by Barclay wherein pump 70 is used to withdraw liquefied natural gas from tank 62 for delivery to heat exchanger 26. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a positive displacement pump as the pump in the combination of Barclay and Dowdell et al. because Emmer et al. explicitly demonstrate that such a pump is well-suited for dispensing liquefied natural gas from tanks, and teach that such a pump can easily produce a variety of flow rates and pressure outputs as desired (column 6, lines 54-58). It should also be noted that Emmer et al. further teach that a centrifugal pump could be used instead (column 6, lines 58-62).

### ***Conclusion***

11. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Richard L. Leung whose telephone number is 571-272-4811. The examiner can normally be reached on Mon-Fri.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Denise L. Esquivel can be reached on 571-272-4808. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Richard L. Leung  
Examiner  
Art Unit 3744

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